IMPERIAL

DEPARTMENT OF AGRICULTURE

FOR THE WEST INDIES

REPORT

ON THE

AGRICULTURAL DEPARTMENT, TORTOLA,

1921-22 and 1922-23.

BARBADOS.

ISSUED BY THE IMPERIAL COMMISSIONER OF AGRICULTURE

FOR THE WEST INDIES.

1924.

[Price Sixpence.]

REPORTS

ON THE

BOTANIC STATION, ECONOMIC PLOTS, AND AGRICULTURAL EDUCATION, TORTOLA.

Annual Reports on Certain Economic Experiments conducted in connexion with the Botanic Station, 1900-2.

Annual Reports on the Botanic Station for the years 1901 and 1902.

Annual Reports on the Botanic Station, Economic Experiments, and Agricultural Education for the years 1902-3 to 1921-22.

IMPERIAL

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REPORT

h the Curator's Compliments

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LETTER OF TRANSMITTAL

Commissioner of Agriculture—to Commissioner, Tortola.

No. 2793.

Trinidad,

11th December, 1923.

Sir,

I have the honour to forward Mr. C. A. Gomez's Report on the Agricultural Department, for the year 1921-22 and 1922-23. The Report contains full details of routine work carried out.

2. The largest and perhaps the most interesting part of the Report is the section on tobacco based upon information obtained in Porto Rico. This account is very detailed and serves as a valuable source of reference for all Presidencies of the Leeward Islands where attempts are being or will be made to grow and manufacture this new crop.

3. During the period dealt with there was great agricultural depression in respect of exported produce, but considerable fortitude was evidently maintained, and the general situation seems to have been ameliorated by the local production and consumption of food stuffs.

I have the honour to be,

Sir,

Your most obedient servant,

FRANCIS WATTS,

Commissioner of Agriculture
for the West Indies.

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STAFF OF THE AGRICULTURAL DEPARTMENT, VIRGIN ISLANDS,

1921-22 AND 1922-23.

Curator	C. A. GOMEZ.
Overseer and Foreman.	S. A. RYMER.
Clerk	B. A. PICKERING.

REPORT ON THE AGRICULTURAL DEPARTMENT, BRITISH VIRGIN ISLANDS.

For the Years ending 1921-22 and 1922-23.

Work in the Garden and Observations on Plants.

The Ground of the Experiment Station lies a couple of hundred yards north of Roadtown, the capital of the Presidency. This land was originally a part of the Lower Estate and was mainly under cane cultivation.

The Experiment Station was started in 1900, when 14 acres of level land of the above mentioned estate was laid off in 1 acre plots and subsequently planted with various crops and plants for economic and decorative purposes. From that date the area under experimental cultivation has been steadily increased. The Station has a good water-supply for its nurseries. This is supplied from an excellent well, over which an Aermotor is erected. This pumps water to a collecting tank and in addition to supplying the Station with water, serves the general public around the vicinity of Roadtown district. A line of pipes from this tank running to the public road and emptying into a cattle trough also offers a wholesome supply of water to all stock in the district.

As in previous years the work of keeping the grounds in a tidy and attractive condition was well maintained, and it may now be said that by the cutting out of much overgrown vegetation and the better spacing of the trees on the lawns and borders a decided improvement in the appearance of the Station has been effected. Among the plants in the Garden which flowered during the year, the following were especially notable :—

Spathodea campanulata producing bright red flowers on terminal spikes. *Tecoma spectabilis* one of the well-known Poui trees of Trinidad, which for a few days in the dry season is a showy mass of bright yellow flowers. *Bauhinia variegata* var. *alba*, *Gliricidia maculata*, *Poinciana regia* *Cassia* sp., *Thunbergia*

erecta, *Plumbago rosea*, *Allamanda schottii*, and *Bougainvillaea*. Conspicuous amongst the plants on the flower borders were a few of the Screw-Pines, *Pandanus utilis*, producing characteristic spirally arranged leaves and prop roots. An avenue of Saman trees, *Pithecolobium Saman*, with their wide spreading branches offers grateful shade along the road through the Experiment Station.

Of the palms established in the grounds the most successful are *Oreodoxa regia*, *Caryota urens*, *Livistona chinensis*, *Pritchardia pacifica*, *Arecasp*, *Cocos. plumosa*.

Work In the Nursery and Distribution of Plants.

The Station nurseries continue to enter very largely in the general agriculture of the Presidency. From these nurseries the peasants obtain planting material of a very varied nature as will be seen from the plant and seed distribution list below. During the period under review every care was taken to increase the output of the nursery with very successful results. The new line of work in grafting the mango by "approach" was carried on successfully by Station staff trained by the Curator.

It is pleasing to note the increasing demand for grafted mangoes and provision is being made to carry on this work on a large scale.

A special feature of the nursery work during 1922-23 was the raising of tobacco plants. Over 50,000 plants were raised for experimental purposes and cultivation. A note on the laying out of the tobacco seed bed for 1922 appears in another part of this report and may be of special interest to intended growers.

Experience at this Station teaches us that the germination of tobacco seed although presenting many difficulties, can be easily surmounted by the adoption of the methods indicated in this report.

The germination of coconut plants is now chiefly done by the grower himself. It is known that some 2000 seed coconuts were put to germinate in private nurseries under the Curator's supervision with very good results.

The year 1922-23 proved a record one for the distribution of plants and seed from the Station.

The following were distributed during the period 1921-22 and 1922-23

Onion seedlings	429,935
Coconut plants from Station	433
Sugar-cane plants	9,763
Limes, oranges & grape fruit plants ...	2,567
Vegetables	3,857
Decorative plants	676
Gliricidia cuttings	1,630
Papaw plants	100
Tobacco plants	54,490
Vanilla cuttings	28
Guavaberry plants	16
Grafted mango	1
Elephant grass cuttings	27
Guinea grass roots	468
	503,991

SEED DISTRIBUTION.

Cotton seed	1,172 lb
Onion seed	30 „
Peanut seed	78 „
Tobacco seed	½ „
Pigeon pea seed	77 „
Tomato „	20 oz.
Guinea corn „	5 „
Seed coconuts	1,084

Work in the Experiment Station.

The plot experiments with various crops were again conducted as follows :—

Sugar-Cane.

The variety sugar cane plots proved very useful as a source of planting material to the peasantry during the periods under review, so much so that from time to time the varieties were cut out and made up into plants for establishing peasants fields. This naturally affected the actual yield of the varieties, and hence no figures of yield were available for the period.

The distribution of 10,000 cane plants from the plots during the periods under review proved a record one and will in time be of great value in the improvement of the general cane cultivation in the Presidency.

It may be interesting, however, to state that the varieties at present best adapted to Virgin Islands conditions are :—B. 6308, B. H. (10) 12, B. 6388, and Sealy Seedling. As in previous years the rows of the Bourbon variety proved very poor and not worthy of a place in future experiments.

As in the past, the canes produced from the plots were crushed at the Station Sugar Works, manufactured into sugar and found a ready sale locally.

Ground Nut (*Arachis hypogea*).

An interesting experiment with ground nuts was conducted during the period under review. The varieties grown were of American and St. Kitts origin.

The following table shows the result obtained :—

Variety.	Date of planting.	Size of plot.	Actual yield of plot.	Calculated yield per acre.
American origin	July 28.	2/25 acre	152 lb.	1,900 lb.
St. Kitts ...	Sept.	1/25 „	40 „	1,000 „

A sample of the American ground nuts was submitted to the Imperial Institute and below will be found their interesting report.

Report on Ground Nuts from the Virgin Islands.

The ground nuts which are the subject of this report were forwarded to the Imperial Institute by the Curator of the Experiment Station and referred to in his letter No 1/22 of the 4th January, 1922.

Description.

The sample weighed 3lb. and consisted of undecorticated ground nuts which were unbroken, fairly clean and in good condition. The kernels were generally large and plump, a few however being shrivelled or undeveloped.

Results of Examination.

The nuts consisted of husk, 26 per cent, and kernel, 74 per cent. The average weight of the kernels was 0.37 gram.

The kernels contained 4.8 per cent of moisture and and yielded on extraction

with light petroleum 48.8 per cent of oil, corresponding to a yield of 51.1 per cent from the moisture free kernels, or 36.1 per cent from the entire nuts received. The oil was of normal appearance and had a satisfactory low acid value of 0·55.

Commercial Value.

These nuts show a slightly higher percentage of husk than West African ground nuts of which the husk usually amounts to about 23 per cent.

The kernels, however contain a normal percentage of oil, equal to that generally yielded by West African kernels.

Unshelled ground nuts similar to this sample would therefore probably realise price slightly below the current figure, but consignments of the kernels should be readily saleable in the United Kingdom at the prices ruling for shelled groundnuts.

The following prices were recently quoted for groundnuts in Liverpool (March 1922.)

Nigerian shelled	£21. 15s per ton
Gambia Unshelled	£17—£17. 10s per ton.

Remarks.

This sample of groundnuts is of good quality, and consignments of similar character, either shelled or unshelled, would find a ready market in the United Kingdom.

Cotton.

The usual experimental area under cotton was again planted during 1922. This plot served the purpose of demonstration as well as that of an experiment. Owing to the very dry weather experienced in May and June only a ¾ acre of the 1½ acres originally planted was established in the Montserrat type of cotton during July. Growth during the wet months of November and December was very rapid and caused a good deal of boll-dropping. The first crop of cotton was reaped in January and February, when 500lb. seed cotton was produced. This on ginning gave 135lb. Lint or 27%. The calculated yield of the plot was therefore at the rate of 130lb. lint per acre. This is an improvement on the average result obtained in the Presidency during the year.

Onions.

During the periods under review the area of the onion nursery had to be greatly extended owing to the increased demand for onion plants. The area under onion cultivation was somewhat curtailed owing to the abnormal demand for onion plants by the peasantry necessitating the sale of seedlings intended for experimental purposes to the general public.

A small plot was however established with onion seeds obtained from Bermuda with the following result :—

Results of Experiment with the Growing of Bermuda Onions in Tortola B. V. I.

Date of Transplanting.	Area planted.	Actual yield from plot of cured onions	Calc. yield per acre.	Date reaped.
Latter part of November.	1/20 acre	360 lb.	7,200 lb.	Middle February good quality readily sold.

The yield from the seed imported from Bermuda although not quite as heavy as that obtained from the Teneriffe seed is very satisfactory as it enables onions to be produced earlier in the season. It was unfortunate, however, that further attempts to obtain seed from Bermuda to continue and increase the area under this type of onion did not prove successful.

CITRUS PLOTS.

The citrus plots laid out in 1920 have passed through a series of protracted droughts and are not therefore in a very flourishing condition. The rainfall gradually fell off below the average during the past 3 years, and has undoubtedly had cumulative effects on these plots, nevertheless some few grapefruits and limes are doing as well as could be expected under the circumstances.

The natural aspect of these plots is rather exposed and the windbreaks planted are not very effective. It may not be out of place to record the satisfactory progress made by the young citrus cultivation recently laid out at Pasea Hall Estate, the property of the Honourable W. C. Roy.

This cultivation is situated in a sheltered valley on a sloping hillside and was established from plants produced by the Experiment Station in 1920. On the advice of the department the young fields of Citrus were sub-divided by rows of *Gliricidia maculata* which also forms a valuable windbreak. The growing of *Canavalia ensiformis* and *Tephrosia purpurea* between the rows of citrus was adopted soon after the fields were planted and kept in proper cultivation for green dressing purposes. This, together with the sheltered aspect of the field, has been responsible for the improved development of this citrus grove as compared with the plots situated on the flat lands of the Experiment Station and and offers a very valuable demonstration of the possibilities of growing citrus fruit trees in the more sheltered sloping valleys of Tortola.

At the time of writing the citrus trees at Pasea Hall have started to flower and fruit and at present are in a most hopeful and healthy condition. A small area of the above treated with a dressing of 3 lb. per tree of the following mixture is showing very promising results :—

Cotton Seed Meal	...	...	...	277 lb.
Acid Phosphate	...	...	...	112 „
Sulphate of Potash	...	...	...	20 „
				409 lb. per acre.

COCONUT PLOTS.

These plots were established at the Station to demonstrate the suitability of this crop for general cultivation in the Virgin Islands. Apart from their success they have served as a convenient source for seed nuts for the younger plantations since started and have been well patronized.

In 1922 the area under this cultivation at the station was subdivided into four plots and received the following manurial treatment :—

The following Manures were applied in 1922—23 to Plots.

Plot No 1. Treated with Mixtures of	Cotton Seed Meal	144 lb.
	Acid Phosphate	100 „
	Sulph. of Potash	40
		284 lb.
		(5 lb. per tree)
Plot No 2. Treated with Mixture of	Cotton Seed Meal	200 lb.
	Ground Bone Meal	100 „
	Sulph. of Potash	60
		360 lb.
		(5 lb. per tree)
Plot No 3. Treated with Mixture of	Cotton Seed Meal	5 lb.
	Common Salt	4 „
		9 lb.
		(9 lb. per tree)

Plot No 4. Forked & Mulched with Cane Trash & Megass & 5 lb. Common Salt per tree applied.

The future development of these plots will be carefully recorded.

TOBACCO EXPERIMENTS.

The small experiment with the growing of tobacco at the Experiment Station gave such promising results in 1920-21 that the Curator was sent to Porto Rico for a short period to make investigations and enquiries into the methods adopted in that country in the growing and curing of tobacco. As a direct result of this mission a very detailed and interesting experiment was successfully carried out at the Station and it may not be out of place if the general Porto Rican principles of tobacco cultivation upon which these experiments were based, are given here :—

Methods and Principles of Tobacco Production.

THE SEED BED.

A good piece of land of a loose loamy nature and having a gentle slope is generally selected for the seed-bed, although it is sometimes made on level lands. The preparation of the land should be started several months before the time to sow the seed, so as to put the soil in perfect condition.

The land is given its first ploughing in the month of July when it is broken to a depth of eight inches. At this operation all vegetable matter is turned under the soil and given time to decay.

The land is again ploughed about the end of August. This kills the new growths of weeds which have come up since the first ploughing, and also puts the soil in better tilth. After this second ploughing the frame-work for the shade is erected. This is done by planting wooden posts in the ground at a distance of 24 feet by 32 feet apart, the height of a post being about 6 feet. These posts are joined at the top in each direction by by stout wires fastened to the posts with staples.

After the frame is erected the land is run over with a spike-toothed or disc harrow in order to break up all clods, and loosen up any portion of the ground that may have become packed. At this stage the cheese cloth is put over the frame-work of posts. It should be stretched over one wire and under the other in the

32-feet spaces. Two widths 16 feet each, of cloth are generally used for this purpose so that it will not be blown up by the wind, and each edge of the cloth is sewn to the side wires. A second cloth is then laid loose under the first one. This is attached loose so as to facilitate its removal at a definite stage of the germination of the seed.

The sides of the nursery are also covered in with cheese-cloth, and after the cloth is up the nursery is laid out in beds about 3 feet wide, with a small trench made between each bed. This makes weeding operation and the pulling of seedlings by labourers easy, while in the event of heavy rains the trench carries off all excess water and keeps the nursery properly drained. The beds are further brought to as fine a state of tilth as possible by the use of hand-rakes and hoes, and are finished off slightly rounded.

In large nurseries cross-drains are sometimes necessary to prevent damage by heavy rains. If the nursery becomes water-logged the seedlings turn yellow and become affected by a form of wilting disease. Proper drainage is important, as whole beds are often lost from wilt. After the beds have been brought to as fine a surface as possible the seed is sown.

Before sowing, the seed is mixed with cotton-seed meal or ashes at the rate of 2½ ozs clean seed to a small bucket of cotton-seed meal or ashes. This will sow a bed 3,072 sq. feet in area. The mixture of cotton-seed meal and tobacco seed is then scattered broadcast over the beds, care being taken to distribute same as evenly over the bed as possible. The seed is then firmly pressed to the soil with a suitable instrument, such as a broad flat hoe or a small piece of board with a handle. The beds are then covered over with two layers of cheese-cloth so as to conserve the moisture in the soil. The seed-bed should not be allowed to become dry and should be kept watered daily in dry weather.

In 8 to 12 days after sowing, the plants should begin to show above the ground. If the cloth over the beds should become plastered on the ground, it should be loosened up ; at times this is necessary especially after a shower of rain. As soon as the plants have developed 3 or 4 small leaves, the top cloth should be removed, and 2 or 3 days after this operation the other cloth also must be removed. These cloths should be taken off at the end of the day so that the plants may have the benefits of any nocturnal humidity.

When the plants have reached the size of a penny, the loose cloth from the top is taken down, so as to admit more sunlight and permit of the stronger development of the seedlings. The outer layer of the cloth on the top is left on until after the plants are pulled for transplanting.

Plants for transplanting should not be of a large size as they will come to button with too few a number of leaves and should not be too small as they will not stand the transplanting well. It requires about 50 days for plants to acquire size suitable to be transplanted in the fields, at which time they have about 8 leaves. The seeds should therefore be sown about 40 to 80 days before the time desired for planting in fields.

In removing seedlings great care should be taken to avoid injury to the roots or squeezing the tender stem of the plants. It is always best to pull seedlings on a rainy day ; the drawing of plants is also facilitated by sprinkling the bed with water.

Seeds should be sown at different dates to allow for fresh material for renewing purposes. For example, 1st sowing on Sept. 16. 2nd sowing Sept. 30. 3rd sowing Oct. 14. 4th sowing Oct. 28th.

The above remarks on the seed-bed embody the first and essential steps for successful tobacco cultivation, and too much stress cannot be laid on the care that planters should bestow on nurseries.

Some careless planters do not use any kind of shade over their seed-beds and do not put their soil in good condition, and do not mix their seed with cotton-seed meal or ashes. The result is that if the natural weather conditions are exactly right they get plants, but as a rule they do not.

THE PREPARATION OF THE FIELD.

Land for tobacco growing should be well cultivated. The first step in this cultivation is to plough the land good and deep, nine inches or more. The first ploughing should be done during the month of August and the green matter turned under and allowed time enough to decay. A second ploughing is given the land about 30 or 40 days after the first, and in this ploughing the land should be cross-ploughed. A harrow is next passed over the land in order to even it up. The third ploughing should be given only a few days before the land is to be prepared for planting and this ploughing should be done in the direction that the rows are to run. After this ploughing a harrow is run over the land to break up the clods of soil and even the ground. Rows are then laid off 3 feet apart by means of a small plough, which cuts furrows only a few inches deep. The fertilizer to be used is now evenly distributed in the furrows and mixed with the soil by passing a small plough through. Banks 3 feet apart are then made over the fertilizer by means of a small turning plough.

At the time of planting a few men should go over the field with hoes and pull up and even off the banks. The field should also be drained by the digging of trenches about 64 feet apart or as experience dictates for the area under cultivation.

Planting and Cultivation.

Tobacco is generally planted from late in October to early in January, but the best and most popular time appears to be in November. Plants are set out in banks 3 feet apart and at a distance of from 16 to 20 inches from each other.

In planting, the person who is performing this operation should have a peg and a measure. The peg is to be used to make a hole on the bank for the plant, and to loosen up the ground; if the soil is loose this can be done with the hands. The measure is to be used to space the plants regularly. Plants should be dropped on the banks ahead of the person who is planting, and the person who is dropping the plants should keep them in a small basket. The plants should not be dropped too far ahead of the planter; if they are, they will wilt and not take root root easily. The plants should be set out with care, putting fine soil on the roots and pressing the soil around gently. Care should be taken not to leave a hole or any depression around the plant, in which water can collect, as there is danger of scalding the plants on a hot day.

The cultivation of the tobacco field after planting should be started as soon as the plants have taken root and begun to grow. This generally happens about 15 days after planting and is done by means of the hoe, which kills all growth of grass and weeds and also loosens up the soil.

Time and money can be saved in further cultivation by the use of ploughs. Where ploughing is done, the first plough cultivation is the cutting of a furrow near the plant on each side of the banks. A small bull-tongued plough is used for this operation, or a one-horse turning plough without the wing.

The second cultivation with the ploughs should be about the same as the first with the exception that the plough should not run as near the plants, so as to avoid damage to the roots. A hoe cultivation should follow the second ploughing, killing all grasses and weeds on the banks and pulling up loose soil around the plants. From now on, the cultivation depends on the weather and growth of the plants

After each rain if possible the plants should be cultivated and the cultivation with hoes be kept up as long as the plants are not too big for implements to get between without doing damage to them.

Topping.

As soon as the first button flower appears, topping should be started. In the first topping only the button is broken off; it is in the second topping that most of this work is done, when one or two small leaves are to be pulled off with the button. A third topping is also done. In this topping all of the plants in the field should be topped, and at the same time small leaves from other plants that are not developing should be taken off. The third topping should be lower than the second, and after this the field should be gone over and evened up, the object being to get all plants as near the same height as possible. A lot depends on this. If the topping is even, the leaves will ripen the same time and thus facilitate harvesting.

If a heavy grade of tobacco is wanted the plants should be topped low with a less number of leaves, and if a light wrapper is required, topping high is advisable. Topping plants too high produces leaves poor in elasticity, and too low topping produces leaves too heavy. Experience in this operation is necessary in order to know just how plants should be topped.

After topping suckers generally appear; these should be removed as they appear as they sap much strength from the plant and rob the main leaves of plant-food.

Second Crop.

A second or sucker crop can be produced after the last top leaves have been reaped from the plants. To produce a good sucker-crop the best suckers should be topped, leaving 2 or 3 leaves only to develop, these leaves make a very good short-filler.

If the harvesting of the crop is done by the stalking system, a ratoon growth is developed, which sometimes produces tobacco suitable for filler purposes, but this practice is not much in evidence in Porto Rico.

Seed Production.

The tobacco plant seeds freely from the second crop, but care must be taken to select plants of desirable characteristics for the production of a standard quality seed.

Indiscriminate gathering of seed from any and all plants will result in poor germination, with leaves of all kinds, sizes and shapes, many of which are undesirable for wrapper purposes and only suitable for a low grade of fillers.

In gathering tobacco-seed, the seed-capsules should be dark brown before they are cut from the plant. After cutting they are exposed to the sun for a day or two until thoroughly dried. The capsules are then broken and the seed cleaned and bottled until ready for use.

Fertilizers.

The tobacco plant is known to be a heavy feeder and responds readily to manurial treatment, but great care must be taken in selecting the right manure, as some types produce tobacco of undesirable characteristics. The application of manure to tobacco fields in Porto Rico is systematically done by the large growers each year, and is now considered an important line of work in tobacco cultivation. Manures are applied in various forms as follows:—

Green Manures.—Leguminous crops, especially cowpeas and velvet beans are grown in fields and ploughed under during cultivation, with very good results.

Decomposed Compost and pen Manure.—This is made by an accumulation of all plant debris, grass, etc., mixed with animal manure, chiefly horse and cattle. The use of pen manure from goats and pigs is not recommended as such types are known to impart an undesirable flavour to the leaf and on this account should be avoided. Manures should only be applied in a well decomposed state.

Commercial Manures.—These are now gaining great popularity in Porto Rico where the more important American Companies have conducted large scale experiments, and recommend the following mixtures per acre :—

No. 1	850 lb.	Cotton-seed Meal
	500 „	Ammon.-Phosphate
	200 „	Steam Bone Meal
	250 „	Sulphate of Potash
No. 2	850 lb.	Cotton-seed Meal
	300 „	Ammon.-Phosphate
	200 „	Steam Bone Meal
	500 „	Sulphate of Potash

Cotton-seed meal is generally used in all mixtures and is considered a very good source of nitrogen for tobacco. It also contains small amounts of phosphoric acid and potash. The chief potash salt used is sulphate. This is stated to improve the combustibility of tobacco.

No form of potash containing chlorine such as muriate of potash should be used, as the chlorine is considered harmful.

Phosphoric acid is said to hasten the maturity of the plant by rendering available the other elements with which it comes in contact.

Irrigation and Drainage.

As a general rule rule irrigation is not practiced in Porto Rico although in some of the drier districts a certain amount of irrigation is in vogue. In case of droughts, irrigation would undoubtedly be most beneficial and productive of best results but as tobacco is planted only in the wet season, the use of irrigation has not gained much popularity.

In the low level lands a good drainage system is imperative as after heavy rains the water remaining in the field turns the plant yellow and causes serious damage to crops. On the hillside, cultivation drains should be cut above the field in order to carry off the water and prevent the flooding of the field.

Insect Pests and Diseases.

The principal pests of Tobacco in Porto Rico are as follows :—

The Changa or West Indian Mole Cricket can cause serious damage to tobacco fields. This insect feeds on and devours the entire shoot of the young plant. Sometimes the seedling is gnawed through at the base, and the tender roots also are eaten. One of the earliest methods used in combating the changa, was to wrap the leaves of Mamey (*Mammea americana*), about the roots of the plant, in the form of a spiral or cup, and plant in the ground with the seedling inside. After the young plant has started to grow, the mamey leaf must be removed, or it will impede the growth of the plant.

Another means of controlling change is by the use of poison baits. The most satisfactory bait is a dry mixture of 3% paris green with cheap flour sprinkled around the tobacco plant.

The Common Garden Slug causes great damage in tobacco fields by eating off the young shoots of the plant. The outer leaves of the small plants in contact with the soil are first attacked. This pest is checked in Porto Rico by sprinkling tobacco dust in the rows and around the plants. Slugs are also controlled by hand collecting at nights.

The Flea Beetle is another insect that causes damage in tobacco fields by eating very small holes through the leaves of the plant. This insect is combated by the application of a mixture of 51 parts of arsenate of lead and 50 parts ashes or lime to the leaves by means of a dust-gun. Early in the morning while the leaves are yet damp the beetles can also be trapped by the use of a small stick smeared with tallow.

The Wire Worm attacks tobacco plants near the surface of the ground and eats the heart out of a plant. There is as yet no practical method of controlling this insect.

The Greenhorned Worm also attacks tobacco and if left unchecked will cause damage to the leaves. They are however easily controlled by daily hand-picking.

In applying lead arsenate to tobacco care must be exercised especially after the leaves have reached a large size, as it will turn them white.

The chief plant diseases affecting tobacco in Porto Rico are as follows :—

Wilt or Damping off :—The wilting of seedlings is at times very commonly met with, and is sometimes responsible for the loss of entire seed-beds. The disease is caused by a very small bacterium which enters the plant through the root and multiplies so rapidly that the transpiration current of the plant is cut off. The only remedy known is the application of lime to the affected soil and the rotation of crops known not to harbour the germ.

Black Root.—This disease may occur either in the see-bed in the field, and can be easily recognised by examining the roots of the plants. The chief symptom is the decay of the root system, and the small roots will show black spots undergoing decomposition. Often plants die in the field from this disease just before reaching maturity. If the disease is found in the seed-bed all plants from that bed should have their roots washed in water and all affected seedlings burnt. Crop rotation is advocated as a means of controlling this disease, avoiding the growing of legumens.

Mosaic Disease.—The chief symptoms of this disease is the mottling of leaves, portions of which are of a lighter green colour than the remaining portions, and mottling may also extend to the flowers. This disease is highly infectious and can be transmitted by labourers touching diseased leaves and then handling healthy plants.

Infected plants never recover but are seldom killed. Mosaic disease lowers the yield and the quality of the tobacco.

HARVESTING.

It is rather difficult to tell exactly when tobacco has attained the proper degree of maturity for gathering, and so much depends on the quality of the tobacco that practical experience is necessary.

In the case of shade-grown tobacco the leaves should not be gathered too ripe, As soon as the leaves turn from green to yellow, they are ready for harvesting. and with proper weather conditions, this should be around fifty days, but much depends on what the weather conditions have been. If much rain is experienced a lesser time is required than if the weather is dry. If the tobacco has been grown in the sun it will take a longer time to mature, as sun grown tobacco does not develop as fast as tobacco grown under shade.

In the case of shade grown tobacco the right degree of ripeness is said to be reached when the second sucker near the top of the plant attains the length of about $\frac{1}{8}$ of an inch. In sun grown tobacco the degree of ripeness is attained when the third sucker from the top of the plant reaches this length. A ripe tobacco plant when shaken should rattle slightly and the leaves should break from the plant with a snap. The top leaves of a ripe plant should be well spread out.

There are two methods of harvesting leaves in Porto Rico, priming and stalking. In priming tobacco, the leaves as they ripen are cut from the plant, leaf by leaf, and this is the only method of harvesting, employed with shade tobacco. The other method known as stalking is performed by cutting the whole plant. Great care should be exercised in handling tobacco, no matter by which method it is reaped. The leaf should never be torn, bruised or sun-burnt. when harvesting, the yellow leaves from the bottom of the plant should be thrown away as they are trashy and of no value.

In prime-harvesting, the leaves are plucked from the plant one by one and kept in a small straight pad. The leaves as plucked are passed to other labourers, who carry the pads or tobacco and place them with great care on a litter made of board covered with burlap. When the latter is filled with pads of leaves it is covered over with burlap to protect it from dust and direct rays of the sun. The litters are then carried to the curing barns.

When the stalking system of harvesting is adopted the cut plants are allowed to lie on the ground for a few hours until wilted after which they are transported to the curing barns.

The practice in harvesting tobacco is to divide the leaves as plucked from the plants into their respective classes, as this saves no end of time and labour in the packing houses. For general purposes tobacco can be harvested in three classes as follows :—

No. 1 Middle leaves of plant.
No. 2 Top leaves of plant.
No. 3 Sand leaves of plant.

The No. 1 (Medio) is made up of the leaves produced from the middle portion of the plants and constitutes the best leaves on the plants. These are plucked after the bottom leaves (No. 3) and should consist of about nine leaves per plant or 50 per cent. of the plant.

The No. 2 (Corona) is made up of the three upper leaves of the plant and are called tops. These leaves are dark and heavy and are the last leaves to be gathered from the plants. Tops form about 19 per cent. of the plant.

The No. 3 (Pie) is made up of the four lower leaves of the plant after throwing away the yellow leaves at the bottom of the plant. They are known as sand leaves and are the first to be gathered, forming about 25 per cent. of the plant.

The Curing Shed.

After harvesting, the tobacco is taken to the curing-barn to be cured and dried. The curing-barn should be located in a dry spot, where the wind can enter through the side windows. The constuction of the barn depends on the financial status of the grower. Some growers erect curing-barns out of purely native material. The framework is made from posts cut from native trees, the sides being joined together by native rods and covered over with grass and palm leaves. The roofs are thatched with grass or cane trash. The better curing barns are made of imported lumber framework and sides, while the roof is covered over first with layer of the dried sheath of the Royal Palm (called Yaguas in Spanish), over which galvanized iron sheets are placed. The usual curing barn of this type is about 80 feet long, 36 feet broad and 16 feet high It is very important that the barn should be sufficiently tight to prevent air-currents when closed, so as to control the temperature and humidity. The side windows should be placed in the long sides of the barn at every 4 feet, and one large door on each short side of barn to admit labourers. The shutters

on the windows should be hung at the top and pushed open by means of sticks of various lengths to adjust the admission of air, and so regulate the inside condition of the ban. The windows should be covered with double cheese-cloth.

The interior framework of the barn is constructed with poles and cross-poles so that the whole space can be utilised for hanging the leaves. In some barns strong wires are tightly stretched and take the place of the smaller cross-poles. Large tables are place in the barns so as to facilitate the sewing of the leaves on to the sticks for drying.

Curing.

The leaves from the field in their respective classes are brought into the curing barn and placed on burlap spread on the ground. If the tobacco cannot be handled right away it should be divided up into small pads of leaves so that it will not get hot and start to sweat.

In prime curing, the tobacco leaves are placed on the tables for sewing on the sticks. The sewing is done by running a needle threaded with cotton twine through the base of the mid-rib of about 35 leaves. The ends of the strings are then attached to a stick about four feet long and hung on the cross-poles in the barn. Leaves should be sewn back to back and should be well spaced on sticks care being taken that room is left at each end of the stick so that it can be hung in the barn without jamming the end leaves together.

The tobacco is left in the barn for a sufficient time to allow moisture to dry out of the leaves and the time taken varies according to the quality of the tobacco and the weather conditions experienced. As a general rule the No. 1 or middle leaves will take from 36 to 45 days to cure, the No. 2 or top leaves from 35 to 40 days, and the No 3 or sand leaves from 20 to 25 days; but at the time that the tobacco is to be taken down if any green stems are found, it must be left a few days longer. If the tobacco is found to be thoroughly dried in less time, it can be taken down.

The practice of cutting and curing the whole plant is advised in the case of the more inferior fields of tobacco, which do not promise a high percentage of wrapper leaves. When the cut plants are are removed from the fields they should be hung up in the curing barns, and when dried, the leaves should at once be removed, and the middle, top and sand leaves kept seperate.

Of the two systems of curing, priming is now almost universally adopted in Porto Rico.

In good weather the shutters of the barn should be left open during the day and closed late at nights; but if the weather is damp, small fires of charcoal should be made in the barn. This drives off the excess moisture and prevents moulding and damage to the leaves. Green tobacco should never be hung over fires as the heat will cook the life out of the tobacco.

In a barn of the dimensions quoted above, 20 fires made in holes in the ground will be ample. During very hot days the barns should be kept closed and opened the following night.

Tobacco in the barn should not be hung too near the ground as it cuts off the circulation of the air, and the tobacco occupying the lower part of the barn, as soon as it is dried, should be placed in a higher position, so that it will not mould. After tobacco has reached a dry stage in the barn, it should not have much ventilation, perhaps, an hour in the morning if it is found in high case (dampish) if in dry condition the barn should be kept closed. Much air during this period of curing causes the tobacco to spend or lose quality.

When the tobacco is dry and ready to be taken down, the shutters of the barn must be opened during the night or at least before daylight, so that the tobacco can come into case. If there is wind duing the night the tobacco will not often come into case at all. On a damp day tobacco can be taken down during the entire day,

but during very damp weather discretion must be used, as too much moisture in the leaves causes a too violent and rapid fermentation, and has a tendency to darken the tobacco in the fermenting piles.

Care must be taken to get the tobacco to the warehouse in the proper condition, as it will avoid no end of work in the warehouse.

In taking down tobacco in the barn the string is pulled out of the leaves, and the leaves from the two sticks are tied into one bundle called a hand. These hands are either packed into boxes, or small round bales. The bales are made by placing the tobacco hands on burlap in rows about 4 layers deep, and three hands wide ; the heads of the hands are always turned on the outside. The burlap containing the tobacco is then rolled tightly and sown and sent to the warehouse the same day.

Classification.

On receiving the cured tobacco at the warehouse, the bales are taken down to the classification room, where they are spread open before the classifiers (women and girls generally), who thoroughly shake the hands of tobacco and clean the leaves of all bad or indifferent ones which were included in hands at the curing barn.

Some packers do not submit their tobacco to any further classification, but adhere to the field classes of No 1, 2, & 3; in which case the classifiers only shake the hands open, and pick out bad leaves and then ferment. Others however make a further classification as follows :—

The No. 1 (middle leaves of the plant) is sub-divided into classes, a long and a short. This represents the best portion of the tobacco produced in any plant. The long is the best type of middle leaves and is suitable for "Binder" and "Wrapper" purposes. The short is suitable for the high grade filler or low grade of binders, and is made up of the shorter leaves obtained from the middle portion of the plant.

The No. 2, is known as the top (Corona) leaves. This is also sub-divided into two classes the good and the inferior. The good is made up of the heavy bodied leaves of high grade, and is used for the heavy bodied filler.

The inferior is made up of the coarse leaves of inferior quality and is used as a low grade of coarse-type filler. The No. 3 is made up of the bottom leaves of the plants. Generally the 2 pairs of ground leaves form this class. This No. 3 is also sub-divided into two groups, a good and an inferior. The good should consist of the best of the bottom leaves, and is used for "low grade wrappers," "binders" or "fillers" according to requirements. The inferior consists of the broken bottom leaves of the more inferior grades of the bottom leaves. This grade can be used for low grass filler and cigarettes.

This classification splits the three general recognised grades of tobacco made up in the curing barns, into six sub-divisions. In the process of this operation a very different and broken kind of leaf is thrashed out. These bad leaves are put together and classified as Boliche, which is designated, "Cigarette tobacco."

Certain hands may also be found to be of extremely poor quality, lacking life and affected by some form of leaf disease contracted in the curing barn. These leaves are graded by themselves fermented separately, and are known as the most inferior grade, called in Spanish "Sancochado." This type is sold to small factories for the making up of an inferior grade of cigars, and is not met with if the tobacco is properly handled in the barns, it being the result of damaged leaves.

It is only used for a very low grade of filler, or sometimes only as a fertilizer.

After this classification the leaves are taken in their respective grades to the fermenting house.

FERMENTATION.

The process of fermentation develops colour, elasticity, burning qualities and gloss, and in order to produce a good fermentation, there must be a proper amount of moisture in the leaves and a sufficient quantity of leaves to create fermentation, at least 1,000 lb. of cured leaves.

The fermentation of tobacco depends a great extent on the quality of the leaves, the amount of gum they contain, and the use the tobacco is to be put to. Tobacco should never be over fermented as it kills the aroma and elasticity in the leaves. In fermenting tobacco for wrappers, the colours in the leaves should be well set, and the crudeness sweated out of them. For wrappers 115 to 120 degrees Fahr: and for fillers 120 to 130 degrees Fahr: should constitute the average degree of fermentation necessary; but there are types that will require longer fermentation than others, but this depends on soil and climatic conditions. When dark colours are required the fermentation should proceed very slowly and not as high. It at any time during the process of manufacture the tobacco is found to be under fermented it can be submitted to a process of refermentation by the casing of the leaves and fermenting in piles. It would therefore be less risky to under ferment than to over-ferment, as fermentation can be put into tobacco, but can never be taken out. In order to give some idea of the most accurate process to produce best results the following method should be adopted.

FERMENTING PILE.

The hands of tobacco are carried from the classification room to the germentation room where each class of tobacco is built up in piles of from 2,000 to 8,000 lb, and fermented separately.

A pile is made of rims of hands built up in the shape of a wall, the centre of which is filled in with hands of tobacco placed in straight rows altogether making a compact mass. To start a pile a layer of cheese cloth is spread on the wooden floor, and the hands of tobacco laid in regular rows flat on the cheese cloth, each layer contains from about 10 to 14 hands of tobacco in the width of the pile and is so arranged that the heads and hands are always turned outside so that a pile containing 10 rows of hands in width should have 5 rows with heads turning outside on the one side, and the heads of the other five rows of hands turning outside on the other. In this way the pile is built up to a height of about 4 to 5 feet, which generally contains about 20 rims of hands in the height, that is 20 hands placed one on top the other in a straight line. The piles are generally made rounded at the ends, and are usually 10 to 11 feet long, but piles may be made shorter and higher, in which case they ferment better. The top of the piles are covered with burlap. In order to ascertain the temperature of the pile a thermometer is used in each pile by inserting a wooden tube in the middle of the pile and placing the thermometer inside the tube. This is more conveniently done when the pile is about 2 feet high or half way built up. The wooden tube is laid flat in the pile, and is long enough to extend from the middle of the length of the pile, to the outer edge. The thermometer tube is generally 6 feet long and with a bore of about one inch internal measurement. This tube is left in the pile and the process of building up is continued to its real height. As soon as the pile is completed the thermometer to which a string is attached is inserted in the tube by pushing it in with a stick and pulled out when needed by the string, thus facilitating its reading at any time. The readings of the thermometer are taken twice daily at 7.0 a. m. and 2.0 p. m. and entered on a fermentation ticket attached to the pile. It generally happens that on about the fifth day the necessary degree of fermentation is reached, that is, about 125 dgr: Fahr: At this stage the pile is torn down and remade. In remaking piles care must be taken to see that the hands do not occupy the same position in the one heap as in the other, as the top and bottom leaves do not ferment so well as the centre. In order to control this important point the top hands,(one or two rows) should be put aside and placed in the middle of the new pile that is being built up, while the hot tobacco from the centre of the old pile should start the bottom layer in the new pile. In this way the top rim

of the pile is put in the centre, and the hot hands of tobacco from the centre, placed on the top or bottom in the new pile. In other words, in remarking piles place cold hands to centre and hot hands to the rim, and in every change care must be taken to have the hands poperly shaken.

In the above manner the operation of taking down and rebuilding piles is generally performed from 4 to 6 times, at a temperature of about 120 degree to 136 degrees. At the end of the fifth change the tobacco should be thoroughly fermented. If however, the leaves of tobacco are of a very heavy body and contain high proportion of oils and gums it may be necessary to continue the fermentation fnrther. It also happens that the temperature of soms piles are noticed to jump suddenly or heat fast. This shows evidence of excessive moisture in the leaves and such piles should be immediately changed. In changing such piles the leaves of the hands should be thoroughly shaken to keep the leaves from plastering together. If plastering takes place, the tobacco becomes dark and mouldy, and is liable to rot. It may also happen that after the pile has had a few changes, the temperature may start to fall before it reaches the required height, and in this case the piles should be torn down and remade in order to keep the tobacco from getting mouldy, making the pile shorter and higher, or by adding more tobacco of same degrees of fermentation, i e. tobacco that has had the same number of changes in piles. For example, two heaps that have been remade three times can be included in the one high pile.

In fermenting heavy bodied types of tobacco, and these produced near the coast it is necessary to submit the tobacco to a more severe fermentation at higher temperature and longer periods in the piles. This type of tobacco should have more changes in the piles than the lighter type grown inland

In fermenting cigarette tobacco (Boliche) it is submitted to two changes in the piles at a temperature of about 130 degrees, if possible, and after this bulk fermentation, the hands are broken apart and the tobacco is submitted to a further process of fermentation. The loose leaves are dampened with an aqueous extract of tobacco stems by means of a knapsack sprayer. A bed of leaves is spred on the floor and thoroughly dampened. This process goes on until the piles is built up to the required height. This pile is allowed to reach a temperature of 130 degrees. If the tobacco is light and chaffy one change is enough, but if it has more gum and body in it, it will be necessary to give it about two or three changes.

The following table shows the thermometer readings during fermentation :—

FERMENTATION CARD.

CLASS OF TOBACCO ... ... No. 1 -Middle.
KIND OF TOBACCO ... ... Sun-Grown.
DATE OF FERMENTATION ... March 2nd, 1922.

Date March.	Temperature Fahrenheit.		Date of Changing.	Date April	Temperature Fahrenheit.		Date of Changing.
	7 a.m.	2 p.m.			7 a.m.	2 p.m.	
2	80	96		1	120	120	
3	100	108		2	120		
4	117	120	1st change	3	118	119	
5	124		March 5th.	4	117	117	
				5	116	116	
6		80		6	115	115	
7	90	96		7	115	114	4th change
8	100	106		8	114		April 8th.
9	109	114					
10	117	120		9			
11	122	123		10	80	80	
12	124		2nd change	11	90	100	
13	127		March 13th.	12	104	107	
				13	110	112	
14	80	96		14	114		
15	99	104		15	115	116	
16	110	112		16	116		
17	114	116		17	117	118	
18	118	120		18	118	118	
19	121			19	119	119	
20	123	124	3rd change	20	120	120	
21	123		March 21st.				
				21	120	120	
22	80	90		22	120		
23	92	93		23			
24	94	95		24	120	120	
25	100	102		25	119		
26	104			26	118	118	
27	110	114		27	118	117	5th change
28	114	116		28	116		April 28th.
29	117	119					
30	118	119					
31	120	120					

CASING DEPARTMENT.

The fermented tobacco from the fermentation room is carried to the casing department where it is wetted by placing and shaking the hands of tobacco under a very fine spray of water for a few seconds, taking care to allow an even distribution of water to come in contact with each leaf in the hands. The object of this operation is to moisten the tobacco as it comes from the fermenting rooms so that it can be handled in the assorting room without breakage, or in other words, to put it in a working condition. The hands of tobacco after casing are packed lightly in waggons, or large boxes lined with burlap.

Each waggon or box carries about 5 rows of hands in width and 15 layers high. These are allowed to remain in the boxes for about 12 hours so as to allow the

moisture to be absorbed by the leaves. This absorption of water by the leaves is especially important as a considerable amount of evaporation takes place during the assorting of the tobacco, and a sufficient quantity of surplus moisture is necessary to balance the natural evaporation in the assorting room.

Care must also be taken not to allow too much water to fall on the leaves during the operation of casing, as an excessive amount of water in tobacco always causes it to darken, and this is of particular importance in wrapper-leaves where colours are of importance.

Assorting.

After casing, the moistened tobacco is taken to the assorting room, where it is assorted into various grades and classes. The object of this operation is to divide the leaves into different classes based on colours and quality, so that the leaves in each are as nearly uniform as possible.

Assorting needs practice and training, as the variations and colours of the leaves met with are quite considerable, and each assorter generally has his own ideas of colour and quality which he bases on the requirements.

In order, however, to bring assorting to as near uniformity as possible the grades are picked out in the following manner :—

The tobacco goes to the openers in hands, the leaves are then thoroughly opened, care being taken not to damage the leaves.

The openers divide the tobacco into the following classes :—

Classes of Sun Tobacco.

1. One grade light wrappers, light in colour, of good texture for best grade cigars.
2. One grade medium wrappers. More dark and more body than No 1.
3. One grade dark wrappers. This grade is used for low grade cigars.
4. One grade light broken wrappers. Same as No. 1 but more broken.
5. One grade dark broken wrappers. Same as No. 2 but more broken.
6. One grade good light-weight filler, possessing good aroma and burning qualities.
7. One grade good heavy-weight filler. Same but heavier than No. 6.
8. One grade light broken filler of more chaffy nature.
9. One grade heavy broken filler, good grade but more broken.
10. One grade light trashy filler of inferior quality.
11. One grade cigarette tobacco most inferior. (Boliche)

As a rule it is only the better class of middle leaves of sun tobacco that is submitted to the above assorting. The other classes, sand leaves and tops, are hand-sized and packed into bales.

Shade Tobacco.

There are certain differences met with in the growing of shade tobacco, and it may be of interest to mention these here.

The cultivation of shade tobacco is generally the same as sun tobacco ; the shade is erected before the plants are transplanted in a manner similar to that described in the erection of shade for nursery.

The farm practice adopted in harvesting divides the tobacco leaves into four grades instead of three as in sun tobacco as follows :—

The No. 1 or sand leaves, is obtained from the four bottom leaves of plant and are used for light wrappers or fillers.

The No. 2 lower middle leaves, is obtained from the eight leaves next to the sand leaves, and are the best leaves of the plants. They are used for the best grade of wrappers.

The No. 3 upper middle leaves, is obtained from the No. 2 leaves next to the lower middle leaves, and are used for heavy wrappers.

The No. 4 top leaves, is obtained from the two top leaves of plant and are used for filler and binder purposes.

Assorting of Shade Tobacco.

The assorting of shade tobacco exacts more careful and skilled work, and as a rule the following grades are picked out in the assorting room after fermentation :—

No. 1 is the best type of light wrappers. It should be light in colour and texture, and free from spots and blemishes. It is used for the highest grade of cigars.

No. 2 is the second best type of wrappers. This should be more or less of the same type as No. 1, but does not have to be as free from blemishes as No. 1. This grade is also light in colour and texture, it furnishes a high grade of wrappers used for the better grade of cigars.

No. 3 follows same general type as No. 2 but has more spots and blemishes. The best leaves of this grade are used on the better grades of cigars, and the more inferior leaves are used on a more inferior grade of cigars.

No. 4 is a low grade of wrappers, light and chaffy is body, perhaps darkish in colour. The best leaves are used for cigar wrappers and the leaves of the more inferior type for binders.

No. 5 is a light grade of filler leaves that have defects which do not allow them to be utilised for binders or wrappers, also leaves without life or elasticity, and broken leaves used for filler purposes.

No. 6 is the most inferior leaf, leaves that are very chaffy and very broken, and this grade is used for cigarette purposes.

No. 7 is a wrapper of a dark colour, but clean of face, that is, free from spots and blemishes. It has plenty of elasticity and is used on good grades of dark cigars.

No. 8 The same general type as No. 7 but more harsh or coarse and defective, and is used for high binders or low grade dark wrapper.

No. 9 is a leaf that in quality is like No 8, but has more blemishes and broken leaves, and is only used for binders.

No. 10. is a heavy grade filler, leaves of the heavy type of tobacco but with defects which will not allow them to be used for binders or wrappers.

No 11. is a grade of thin bodied tobacco, with a yellowish colour, and is used on certain type of cigars for wrappers.

No 12. is practically the same as No 11 in colour and texture, but has more defects causing it to be used for a lower grade of wrappers.

No. 13. is the grade of tobacco that is composed mainly of leaves with rotten stems, is tender, and is, used as a very low grade of wrapper chiefly for binders, and can be composed of leaves of any quality and colour.

No. 14. is similar to No. 13 but is more broken and defective and is used for binders.

Sizing and Tying Department.

After the tobacco is assorted it is sized and tied in small hands. Each leaf is measured to size and put in different heaps.

Leaves are sized to the following measurement :—

9, 11, 13, 15, 17, 19, and 21 inches and all leaves of the same size are put in separate groups.

These leaves are then tied into hands of approximately 40 leaves. The object of this is to facilitate the manufacture of cigars, as different lengths of leaves are required for different sizes of cigars.

From this department the tobacco in hands is carried to the drying room.

In this room the hands of tobacco are hung on sticks for sufficient time to throw off any surplus moisture they may contain. After they are dried they are taken down and made into small piles about 10 × 6 feet without pressure, where they remain for 24 hours, the object being to even up the moisture in each leaf.

Baling.

The tobacco after it is tied in hands according to size is now ready for baling. The inferior grades are put in 120 lb. bales. In baling the hands of tobacco are placed flat on the bottom of the baling-press, which is lined with a layer of burlap. The heads of the hands are turned outside and built up in regular rows in layers, until the press is filled, after which the pressure is put on and burlap sewn over the tobacco. The bales are then put in a framework of wood and are now ready for shipment.

In baling the superior grades the bale is not submitted to any great amount of pressure. Tobacco of this class is made up in hands containing 40 leaves each. Four of these hands are taken and bound together with raphia and are known as carottes. The carottes are packed in a small wooden press in rows of three on each side of the press. Each row contains 12 carottes of tobacco or 36 carottes on each side of the press.

The tobacco is then covered over with Yaguas (leaves of the Royal Palm) and then with burlap, and baled without pressure.

In making up this kind of bale, the only pressure exerted on the carottes is by the packer himself who makes up the carottes in rolls of 12 pressing each carotte on top the other as hard as he is able to do, between his arm and against his chest.

This is known as the Cuban style of packing. The bale is then crated and marked for shipment.

Pipe Tobacco.

The production of pipe tobacco involves certain differences in the mode of cultivation and curing when compared to these employed in the manufacture of cigar tobacco and the first step necessary for the successful production of black pipe export tobacco hinges on the obtaining of the right type of seed.

It is impossible to take cigar tobacco seed and produce the black heavy export type. These types differ in the amounts of natural oils and gums contained in their leaves. The abundance of natural oils and gums in the leaves of the black heavy export type being responsible for the rich black gummy appearance of the manufactured article.

Seed.

There are several strains that produce the black heavy export type and one of the strongest and blackest and most likely to give best results in the West Indies is the "Tennessee Red." The "White Burley" is also a type that is worthy of trial in the West Indies.

Cultivation.

The cultivation of the soil for pipe tobacco is carried on in just the same manner as for any other variety. This type, however, flourishes best in rich well drained bottom lands. Clay soil of higher altitudes, provided that it is rich, will also produce the black export type. As a general rule in choosing soils for this, always select the richest fields because the profit comes from the weight of leaves produced.

Topping.

This type is not topped high. On good soils from 8 to 10 leaves, if soil is thin, top plants to 8 leaves only.

HARVESTING AND CURING BLACK EXPORT TOBACCO

After topping, leaves are generally ripe in about 30 days time. The whole plant is cut just above the ground when the leaves have obtained their maximum granulation, and break when folded between the fingers. The cut plants should be allowed to remain on the ground until they have wilted so as to be handled without breaking the leaves. After reaping, the main stalks of the plants are split with a knife, beginning at the top and splitting to within 6 inches of the other end of the stalk. 5 or 6 plants are placed astride on a stick and then hung in the curing barn. Some manufacturers hang the plant on scaffolds in open sheds, but with the uncertain climatic conditions of these islands this plan is not recommended, as the tobacco will rot if the atmosphere is damp or wet. The better plan would be to allow the tobacco to yellow under open shed for 3 or 4 days and then remove to a proper curing house (as outlined in the manufacture of cigar tobacco). Either way the tobacco remains for 3 or 4 days without heat, during which time it should attain a yellow colour. If possible some means of regulating the ventilation of the barn should be made, because if the tobacco dries out too much at this stage it will be lifeless and lack its rich gum and oil characteristics. After 3 or 4 days of yellowing the sticks upon which the tobacco plants are hanging are crowded to about 6 inches apart on the tiers in the barn and slow fires built of wood are started under the tobacco. The temperature at this stage of curing is not allowed to exceed 95 degrees Fahr., for the first 24 hours, so as to complete the yellowing process. Then the temperature is raised gradually to about 125 degrees Fahr. and kept thus until the leaf dries. When the leaf tissue is dry (not the stem) the fires are allowed to die down and the tobacco becomes pliable from the flow of sap from stalk and stem. The tobacco in this condition is allowed to hang in the barn until the stalk cures itself in the air. (This takes up a period of about 2 months). Sometimes within this period it is necessary to restart slow fires every few days until the leaf is thoroughly dried. By this means the sap is gradually exhausted from stalk and stem and they in turn dry up.

It is important that open wood fires should be used. Fires are generally made of hard wood as they impart odour and flavour, which cannot be obtained from charcoal fires. Care should be exercised to see that the fires are not close enough to the leaf to burn or scorch it and the fires should be slow and not allowed to blaze up much.

In a barn 24 feet square place fires up and down the earthen floor at equal distances apart (and start a low heat at first) keeping the temperature at 100 degreees Fahr. and work up gradually to 124 degrees until the leaf and stem is cured. Firing is generally done in this manner for about 3 to 4 days, and then later, if the tobacco is found to be getting too soft, slow fires should be again started to dry out the excessive moisture in the leaves and prevent moulding. After the tobacco is thoroughly cured in this manner it is taken down from the scaffold, and the leaves made up in bands and packed in casks either loose or pressed. No fermenting is required as the open fires take the place of that process.

The tobacco should be allowed to age for some time before being used as it will mellow with age and become more palatable and not burn the tongue

in smoking. Care must be taken in packing to see that it is in keeping order. Packing in casks is most satisfactorily performed when the stems of the tobacco will break or snap between the fingers and the leaf is just supple enough to bend without breaking.

There is no chemical treatment used. There are, however, certain secret processes used by the different manufacturers to flavour and blend their tobacco according to their requirements. These must, therefore be worked out by the producer himself.

Following as close as possible the afore-mentioned methods of cultivation and curing the following areas were established at the Tortola Experiment Station with the following results :—

Date of Planting	Kind of Tobacco.	Area Planted.	Yield of cured leaf before fermentation.
October & November	San Lorenza \ Cigar Buena Vista / tobacco	2 acres	1,553 lb.
„ „ „	Tennesee Red (Pipe)	4/5 „	375 „
„ „ „	Virginia Pipe	½ „	262 „

The above types grown received a very heavy set back after the 1st leaves were reaped and gave no second crop. With ordinary normal Tortola weather a 2nd and 3rd crop can be obtained, when the yield would be at least 50 per cent. higher than the data quoted above. At the time of writing this report the fermenting of the tobacco was still in progress and a more complete report of the experiment in addition to the working of the Cigar Factory will be compiled in due course.

The planting of small areas in cigar tobacco was taken up by certain proprietors and small growers during the season. In all 12 plots were established and quite good tobacco was grown in the Huntum Gut, Pasea Hall, and Hannah Districts.

The tobacco from these plots is at present at the Experiment Station undergoing fermentation. The crop will be handled on a co-operative basis and at present bids fair to be a profitable business for the Presidency.

The working of the cigar factory is under the direct supervision of the Agricultural Department, and the services of a Porto Rican has been obtained to make cigars and train local hands in their manufacture. The start thus made is very promising.

Progress in the Chief Industries

The following table shows the value of the chief exports from the Presidency for the years 1920, 1921, and 1922 :—

	1920.	1921.	1922
	£	£	£
Seed-cotton	985	19	—
Cotton-lint	5,370	4,249	39
Cattle	7,080	5,351	4,852
Fruits and Vegetables	2,749	3,293	2,322
Charcoal	1,410	1,787	1,543
Small Stock	2,258	2,151	1,595
Eggs	833	1,261	1,291
Horses	300	30	114
Mules	90	26	116
Asses	8	6	—
Dried Fish	312	774	118
Fresh Fish	221	924	360
Hides and Skins	67	39	26
Salt	72	35	24
Hardwood	85	51	47
Straw and Bamboo	1	1	4
Native—made hats	42	16	11
Baskets, etc.	14	21	13
Turtle	15	18	22
Turtle shell	21	6	37
Brooms and Brushes	—	6	7
Mauby Bark	—	—	48
Cassava bread	—	—	10
Coconuts	—	—	18
Cocoa beans	—	—	1
Butter	—	—	1
Plants, seeds and slips	—	—	1
Starch	—	—	1
Firewood	—	—	12
Hoop	—	—	4
Fish pots	—	—	20
	£22,033	£20,064	£12,654

COTTON INDUSTRY.

The planting of Sea-Island Cotton was again resumed in the Presidency of the Virgin Islands in May 1922 after a period of 12 months had lapsed without any planting having been done whatsoever.

This has been very instrumental in eradicating hybrid and native strains of cotton in the Presidency with the satisfactory result of thus improving the standard Virgin Island cotton crop during the year under review.

On the whole, however, 1922 proved a very unpropitious cotton year. During the months of May, June and July sufficient cotton seed was distributed from the Experiment Station to plant 140 acres.

Owing to intense heat after the sowing of seed, at least 50 per cent. of the fields planted succumbed, and subsequent efforts to re-establish cultivation met with only poor results.

At the end of July those portions of the fields which survived made satisfactory development, but fields were in most cases irregular. It is estimated that

approximately 60 acres of Sea Island Cotton were established in 1922. From this area 7,672 lb. lint were produced, giving an approximate yield per acre of 127 lb. lint, an average one for the Presidency, where cultural and manurial methods are of the most primitive and careless nature.

The marketing of the crop was again handled by the Government Cotton Factory and that of the Honourable W. C. Roy, Pasea Hall Ginnery, as follows :—

Government Cotton Factory	6,118	lb. Lint
Pasea Hall „ „	1,554	„ „
	7,672	lb. Lint

From the cotton tables below it will be seen that no native or hybrid cotton is now grown in the Presidency and it is pleasing to report that a ready sale was found for the lint produced with the following comments from the buyer :—

"I have graded the Samples as follows :—

Sample No. 1 Medium Fine to Fine
„ „ 2 - Fine to Extra Fine."

This gives the greatest encouragement to the future of our Sea-Island Cotton Industry and now that a clean start has been effected the matter of yearly increased production will follow in due course. The outstanding insect pest and plant diseases of cotton during 1922 were as follows :—

During December the cotton worm (*Aletia argillacea*) made its appearance but only in isolated attacks and in lesser quantities than in previous seasons.

During February *E iophyes gossypii* was to be noticed in the central and east district of Tortola and Virgin Gorda.

Cotton stainer (*Dysdercus andrea*) proved the most troublesome pest this year and caused some damage to the cotton fields in Tortola. The daily collecting of stainers had to be done at the Experiment Station during January.

The Pink Boll Worm was not noticed to any appreciable extent in Tortola. In Jost Van Dyke and Virgin Gorda towards the end of February slight attacks were noticed, which were immediately dealt with under the Plant Protection Ordinance.

Internal Boll disease did not appear to be anything as dangerous in Cotton fields as it has been in the past.

The staff of the Experiment Station supervising the work of cotton Inspectors was busily engaged in March in the carrying out of the Cotton Protection Ordinance and Close Season.

It is gratifying to state that cotton growers co-operated heartily in the enforcement of the one month's close season and there was no complaint to be made of any grower resisting the enforcement of the close season.

GOVERNMENT COTTON FACTORY REPORT FOR 1922-23 CROP.

The Government cotton factory was opened for the purchase of cotton on November 10 1922, and was closed on April 30 1923, a period of twenty weeks. The former system of purchase at a flat rate from the peasants was adhered to.

The opening price for seed cotton in November was 6 cents per lb. for Sea-Island. The total amount of seed cotton purchased during the season was 21,363 lb. which on ginning, gave 6,118 lb. of lint or 28.7 per cent. a higher yield than in some previous years.

The following is the financial statement of the year's transactions:—

REVENUE.

	£.	s.	d.
To sale of 5,958 lb. lint (24 bales)	456	13	16
" " " 76 bags cotton seed	38	13	10
Value of lint on hand at ginnery (160 lb.)	11	6	2
Cotton seed used for making cotton seed meal	3	0	0
	£509	14	4

EXPENDITURE.

	£.	s.	d.
By purchase of cotton and seed, and cost of ginning crop ...	346	3	0
By balance, profit on crop	163	11	4
	£509	14	4

This shows a profit to the Government of £163 11s 4d on the year's transactions. In addition to this, the sum of £22 3s 10d was paid into the Treasury as export tax on all cotton brought to the factory during the year 1922-23.

The following tables in connexion with the present crop and some previous ones may be of interest.

Table A—Showing weight of Sea Island cotton lint exported yearly from the inception of the industry to the present season:—

Year.	Sea Island, lb.	Year.	Sea Island, lb.
1904-5	4,100	1913-14	28,035
1905-6	7,775	1914-15	31,361
1906-7	10,033	1915-16	22,750
1907-8	52,520	1916-17	14,083
1908-9	42,044	1917-18	10,403
1909-10	23,159	1918-19	23,332
1910-11	50,337	1919-20	23,425
1911-12	43,003	1920-21	49,682
1912-13	31,775	1921-22	
		1922-23	7,672

Table B - Showing the amount of cotton dealt with at the Government Ginnery during the last four years, and its grading. The large proportion.

of 2nd. Grade Sea-Island during 1920-21 was due to the grading of all Sea-Island Cotton produced at Virgin Gorda and Salt-Island as 2nd quality. During 1922-23 only Sea-Island was grown.

This differention of grading was conducted on the advice of the Superintendent of Agriculture for the Leeward Islands: it having been ascertained that in the islands in question the system of ratooning Sea Island cotton was then in practice. It was accordingly rightly considered that this practice should be discountenanced.

Grade.	1918-19.		1919-20.		1920-21.		1921-22.	1922-23
	lb.	per ct.	lb.	per ct.	lb.	per ct.	lb. per ct.	lb. per ct.
1st grade	22,852 =	80·3	27.177 =	79·8	19,634 =	43·3	Close Season.	6,118 = 100
2nd grade	380 =	1·3	523 =	1·5	25,313 =	55·6	„	—
Native	4,334 =	15·2	5,649 =	16·5	481 =	1·1	„	—
Stains	880 =	3·1	725 =	2·1	—			—
Total	28,446 lb.		34,074 lb.		45,478 lb.		„	6,118 lb.

Table C—Showing the amount of Seed Cotton and Lint produced and exported from the Presidency by local dealers during the last four years.

Year.	Amount lb.	Value £.
1918-19	29,460 Seed Cotton	991
1919-20	23,339 „ „	1,120
1920-21	5,987 lint	720
1921-22	Close Season	
1922-23	7,672 lint	600

Table D—Showing the percentage of the total cotton crop handled by the Government and by local dealers. Previous to 1917-18 the Government handled the entire crop.

	1918-19.	1919-20	1920-21	1921-22	1922-23
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Handled by the Government	78·51	82·89	88·3	Close	79·7
Handled by local dealers	21·49	17·11	11·7	Season	20·3

STOCK.

As indicated in previous report stock raising forms one of the chief industries of the Virgin Islands peasantry and in spite of the very poor market conditions the export of stock was a very satisfactory item during the seasons under review.

The growth of the pastures in the Presidency fell somewhat below their usual condition and during the drier months there was not an adequate supply of green fodder for the animals in the eastern district of Tortola and in all the smaller islands.

Attempts to establish elephant grass in pastures to supplement the guinea grass fields did not prove successful. In most localities of Tortola guinea grass still holds top place as being the most successful stock food. Climatic conditions proved somewhat below normal and the stock in many districts of the Presidency, especially at Virgin Gorda and Anegada suffered from unsatisfactory water supply. Considering the abnormal dry conditions existing the general health of the animals may be said to have been fairly good.

The quality of the animals, however, continues to deteriorate and acting on the advice of the Agricultural Department, the Government has sanctioned the purchase of a pony stallion "Jack" and "Ram Goats" for service.

At the time of writing negotiations for the purchase of these animals, through the Mayaguez Experiment Station, Porto Rico, are well in hand and it is hoped within the next few months to have the animals quartered at the Experiment Station for service.

Every effort should be made to develop stock raising in the Presidency.

The Sugar Industry.

As in previous years the sugar-cane grown by the neighbouring peasant growers was dealt with at the Station. The old system of the Station's retaining one-third of the sugar manufactured as its share was adhered to.

About thirty-six peasants brought canes during the season to be crushed, but owing to there being no weighing facilities, the number of tons handled by the works could not be arrived at. The quantity of sugar manufactured for the peasants amounted to three tons approximately.

The following gives the financial position of the crop years 1922 and 1923 :—

Dr.	£.	s	d.		Cr. £.	s.	d
To Sugar Sold	46	4	2	By cost of labour	31	16	4
,, Sugar in Stock		15	0	etc.			
Outstanding a/cs	13	7	9	By Balance	28	10	7
	£60	6	11		£60	6	11

The above shows the net profit accruing to the Government is £28 10 7 which may be considered as satisfactory considering the drop in market value of the sugar produced.

THE AGRICULTURAL OUTLOOK.

During the period under review the agricultural interests of the Presidency have faced several crises. The complete cessation of cotton planting in the Presidency for a one year period caused by the very deplorable condition of the European cotton market and owing to the necessity of controlling the pink boll worm has been greatly felt in all lines of business.

Again, the St Thomas market for our produce was hit hard and stock in particular shipped to St. Thomas was sold at a lower price than in previous years. Climatic conditions again proved unfavourable. This is the third successive dry season and the effects have been to some extent cumulative the rainfall for the year being 40.89 inches. As a result of these conditions both exports and imports have decreased.

The extensive growing of fruits and vegetables can be said, however, to have been well maintained during the period under review and owing to the scarcity of money to purchase imported foodstuffs the increased production of food crops for local consumption greatly assisted domestic conditions in the Presidency.

In order to relieve the situation the growing of pure sea island cotton in the Presidency was again successfully resumed, while tobacco experiments conducted at the Experiment Station and tobacco grown on a small scale by growers seem to give hope that the presidency will enjoy the same commercial prosperity as in the past.

Details of Administration.

STATEMENT OF REVENUE AND EXPENDITURE, AT EXPERIMENT STATION, (1921-22.)

REVENUE.

	£.	s.	d.
Sale of produce, etc.	71	0	0
Land rent	5	8	0
Petty receipts (Hire of Cart, etc.)	2	18	10
	£ 79	6	10

EXPENDITURE

	£.	s.	d.
Personal emoluments	300	0	9
Labour	226	16	11
Clerical assistance	15	0	0
Repairs to Buildings, etc.	13	7	0
Machinery, Tools, etc.	19	12	2
Contingencies	31	13	5
Stationery and printing reports	38	17	11
Purchase of onion seed	19	9	2
Supplies for growth and cultivation of crops	2	18	11
Introduction of plants	3	6	0
Upkeep of Stock	39	19	8
Travelling allowance	4	13	9
	£ 720	15	8

Details of Administration.

STATEMENT OF REVENUE AND EXPENDITURE, AT EXPERIMENT STATION (1922-23.)

REVENUE.

	£.	s.	d.
Sale of product, etc.	79	0	5
Petty receipts (Hire of Cart, etc.)	3	17	4
	£ 82	17	9

EXPENDITURE.

	£.	s.	d.
Personal emoluments	285	8	4
Labour	249	19	1
Clerical assistance	15	0	0
Repairs to Buildings, etc.	67	14	5
Machinery, Tools, etc.	19	19	10
Contingencies	23	5	6
Stationery and printing reports	28	0	4
Purchase of onion seed	19	16	9
Supplies for growth and cultivation of crops	25	7	0
Introduction of plants	9	14	3
Upkeep of Stock	39	19	3
Travelling allowance	—	—	—
	£ 784	4	9

STAFF CHANGES.

There were no changes in the staff during the periods under review.

CORRESPONDENCE, ETC.

During the year January 1, to December 31, 1921 the usual correspondence received attention.

Letters despatched numbered	...	...	235
Letters received "	...	...	135
Minute Papers dealt with"	...	...	31
Publications despatched "	...	...	80
Publications received "	...	...	88

The following donors of publications are cordially thanked: the Imperial Department of Agriculture for the West Indies, the Royal Botanic Gardens, Kew; the New York Botanical Gardens, the U. S. Department of Agriculture, the Chamber of Commerce, British Guiana; the British Cotton Growing Association, Manchester; the various Agricultural Departments of the West Indies, and the Agricultural Department of the Straits Settlements.

OFFICIAL AND OTHER VISITS TO THE STATION.

His Excellency the Governor, Sir Eustace Fiennes, Bart, visited the Station in December 1921.

His Honour Major Peebles, D.S.O. Commissioner, accompanied by Mrs Peebles visited the Station on several occasions during the year.

Other visitors were Mr Donald. D. Jones, Antigua, Mr Sydney Munton, Manchester, and Mr. George. F. Tibbitts of New York.

His Honour F. C. Clarkson, Acting Commissioner, accompanied by Mrs. Clarkson visited the Station on several occasions during the year.

The Government Chemist and Superintendent of Agriculture A.E. Collens, F.I.C., F.C.S., paid visits and inspected the Station during 1921 and 1922.

Other visitors were Mr. J. Mena, Photographer, St Thomas, Mr Julius Matz, Chief, Division of Botany and Plant Pathology and Mr. John. O. More, Assistant Entomologist, both of the Insular Experiment Station Rio Piedras, Porto Rico. Mr. Ralph F. Dairmont, Cotton Department J. & P. Coates Ltd Glasgow Scotland.

PLANT LEGISLATION IN THE BRITISH VIRGIN ISLANDS.

The following statement shows the legislation, in force during the year, for the protection of crops :—

No. 3 of 1897 : Plants Protection Ordinance (An Ordinance to provide against the importation of articles likely to introduce disease among plants.)

No. 5 of 1907 : Fumigation of Plants (An Ordinance to provide for the fumigation of plants imported into the Presidency).

No. 5 of 1918 : Proclamation prohibiting the importation of cotton seed from places outside the Leeward Islands Colony).

No. 7 of 1918 : The Cotton Tax (Government Purchases) : An Ordinance to provide for the payment and collection of a tax on cotton sold to the Government of the Presidency.

No. 5 of 1919: The Cotton traffic Ordinance (An Ordinance to regulate the local traffic in cotton).

No. 2 of 1922 (Cotton Protection Ordinance) An Ordinance to provide for the protection of Cotton.

METEROLOGICAL RETURNS.

RAINFALL MEASURED AT THE BOTANIC STATION, TORTOLA, B. V. I.

1921-22	No of rainy days.	Rainfall measured in inches.	Average. for preceeding 21 years.
April	4	1·31	2·12
May	10	3·05	4·30
June	6	2·21	4·12
July	19	8·06	3·56
August	10	2·04	3·59
September	14	4·96	4·47
October	16	4·06	6·06
November	14	3·40	6·64
December	9	2·69	4·84
January	17	4·02	2·66
February	15	3·48	2·68
March	3	1·61	2·23
	142	40·89	47·27

METEROLOGICAL RETURNS.

RAINFALL MEASURED AT THE BOTANIC STATION, TORTOLA, B. V. I.

1922-23	No of rainy days	Rainfall measured in inches.	Average for preceeding 21 years.
April	7	2·69	2.02
May	12	1·93	4·10
June	12	6·46	3·93
July	11	2·98	3·29
August	13	5·33	3·42
September	12	3·77	4·26
October	10	10·62	5·78
November	7	2·58	6·33
December	16	5·19	4·62
January	3	2·48	2·53
February	4	1·47	2·55
March	5	1·79	2·12
	117	47·29	45·05

(Sgd) G. A. GOMEZ,

Curator.

Publications on Sale

OF THE IMPERIAL DEPARTMENT OF AGRICULTURE

FOR THE WEST INDIES.

The 'WEST INDIAN BULLETIN' Quarterly Scientific Journal.

Volume I :—Full reports of the Agricultural Conference of 1899 and 1900.
Only a very limited number of copies of the parts of Volume I are available, and these cannot be sold separately. Volume I complete in original paper covers as issued, post free, 5*s*.
Volume II, III, IV, V, and VI :—Price 2*s*. each. Post free 2*s*. 8*d*.
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Volume IX, Nos. 1, 2, 3, and 4 :—Reprints of papers read at Agricultural Conference 1908, with summaries of discussions following. Price 6*d*, each number. Post free, 8d.
Volume X, Nos. 1, 2, 3, and 4:—Paper on general Subjects. Antigua Agricultural Conference.
Volume XI, Nos. 1, 2, 3, and 4;—Papers on General Subjects. Account of Imperial Department of Agriculture in the West Indies.
Volume XII, Nos. 1, 2, 3, and 4 :—Papers on the Agricultural Conference, 1912.
Volune XIII, No. 1.—Containing Papers on COTTON and AGRICULTURAL EDUCATION, prepared for the recent Agricultural Conference.
Volume XIII, No. 2.—Containing Papers on SUGAR-CANE EXPERIMENTS IN BRITISH GUIANA, prepared for the recent Agricultural Conference.
Volume XIII, No. 3.—Containing Papers on RUBBER and MISCELLANEOUS SUBJECTS, prepared for the recent Agricultural Conference.
Volume XIII, No. 4.—Containing Papers on FORESTRY, SUGAR-CANE COTTON, LIMES, ETC.
Volume XIV, No. 1.—Containing Papers on PEASANT AGRICULTURE IN THE WEST INDIES.
Volume XIV, No. 2.—Containing Papers on CHEMISTRY, VETERINARY SCIENCE, ETC.
Volume XIV, No. 3.—Containing Papers on VETERINARY SCIENCE, AGRICULTURAL EDUCATION, ANALYTICAL METHODS, and PESTS AND DISEASES.
Volume XIV, No. 4.—Containing Papers on WEST INDIAN INDUSTRIES, WATER-SUPPLY, and PLANT DISEASE.
Volume XV, Nos. 1 2 and 3.—Containing Papers on General Subjects.
Volume XV, No. 4.—Containing an account of the Proceedings of the West Indian Cotton Conference 1916.
Volume XVI, Nos. 1, 2, 3, and 4.—Containing Papers on General Subjects.
Volume XVII, Nos. 1, 2 3, and 4—Containing Papers on General Subjects, especially cotton.
Volume XVIII, Nos. 1, 2, 3 and 4—Containing Tropical Agricultural College Committee's Report, and Papers on Miscellaneous Subjects.

PAMPHLET SERIES.

The following list gives particulars of the chief pamphlets issued by the Imperial Department of Agriculture that are still available :—

SUGAR INDUSTRY.

Seedling and other Canes at Barbados, 1900-4.
Seedling Canes and Manurial Experiments at Barbados,
in 1903-5, No. 40, in 1904-6, No. 44,
in 1905-7, No. 49, in 1906-8, No. 59,
in 1907-9, No. 62, in 1908-10 No. 66, } price 6*d*. each.
Seedling and other Canes in the Leeward Islands,
in 1900-1, No. 12. in 1901-2; No 20,
in 1902-3, No. 27, } price 2*d*. each,
in 1903-4, No. 33, in 1904-5, No. 39,
in 1905-6, No. 46, in 1906-7, No. 50,
in 1907-8, No. 56, } price 4*d*. each.
in 1908-9, No. 63, in 1909-10, No. 67—price 6*d*. each.
Manurial Experiments with Sugar-cane in the Leeward Islands,
in 1902-3, No. 30, in 1903-4, No. 36,
in 1904-5, No. 42, in 1905-6, No. 47,
in 1906-7, No. 51, in 1907-8, No. 57,
in 1908-9, No. 64 in 1909-10, No. 68, } price 4*d*. each.
Sugar-cane Experiments in the Leeward Islands.
in 1910-11, price 1*s*. ; in 1911-12, price 1*s*.

SCALE INSECTS.

Scale Insects of the Lesser Antilles, Part I, No. 7, price 4*d*,
Part II, No. 22, price. 4*d*.

GENERAL.

(43) Cotton Seed and Cotton-cake-meal on West Indian Plantations. Price 2*d*.
(52) Hints for School Gardens. Price 6*d*.
(60) Cotton Gins. How to erect and work them. Price 4*d*.
(61) The Grafting of Cacao. Price 4*d*.
(65) Hints for School Gardens, Fourth Edition. Price 4*d*.
(71) Insect Pests of the Lesser Antilles. Price 1*s*. 3*d*,
(72) Lime Cultivation in the West Indies. Price 9*d*.
(73) Root Borers and other Grubs in West Indian Soils, Price 6*d*,
(74) Cotton Cultivation in the West Indies. Price 9*d*.
(75) Insect Pests of Sugar-cane in Antigua and St. Kitts. Price 6d,
(76) Indian Corn. Price 4*d*.
(77) Erysipelas and Hoose. Price 2*d*.
(78) Onion Cultivation. Price 3*d*.
(79) Diseases of Lime Trees in Forest Districts. Price 3*d*
(80) Hints to Settlers, St. Lucia, Price 6*d*.
(81) Agricultural and Economic Resources of St. Lucia. Price 3*d*.

The above will be supplied post free for an additional charge of ½*d*. for the pamphlets marked 2*d*.; 1*d*. for those marked 4*d*.; and 1½*d*. for No 40, 41, 44, 45, 49, 59, 62, 63, 67, 73, 74 and 75; 2*d*. for No. 72 and 4*d*. for No. 71.

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The principal features of the **AGRICULTURAL NEWS** are as follows:—

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Notes and Comments on Miscellaneous subjects.

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Fruit and Fruit Trees (Citrus, Cacao, Coco-nuts, etc.);
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Special features include

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Fungus Notes (by the Mycologist);
Down the Islands (Items of local interest);
Gleanings' page;
Reviews of new books and Departmental Reports
Miscellaneous Notes;
Market Reports.

All applications for copies of the Agricultural News should be addressed to the Agents, and not to the Department. A complete list of the London and Local Agents is as follows:—

London: Messrs. DULAU & Co., Ltd., 34-36, Margaret Street, Cavendish Square, London, W., 1.
WEST INDIA COMMITTEE, 15, Seething Lane, London, E.C., 3.
Canada: Mr. LEWIS W. CLEMENS, 801, Yonge Street, Toronto.
Barbados: THE ADVOCATE COMPANY, Limited, Bridgetown.
Jamaica: THE EDUCATIONAL SUPPLY COMPANY, 16, King St., Kingston.
British Guiana: THE ARGOSY CO., LTD., Georgetown.
British Honduras: Mr. PERCY GEORGE, 'Clarion Office', Belize.
Trinidad: Messrs. MUIR, MARSHALL & Co., Port-of-Spain
Tobago: Mr. C. L. PLAGEMANN, Scarborough.
Grenada: Messrs. THOS. LAWLOR & Co., St. George.
St. Vincent: Mr. FLORIS SIMMONS, Experiment Station.
St. Lucia: Mr. R. W. NILES, Botanic Station.
Dominica: Mr. W. G. HUTTON, Botanic Garden.
Montserrat: THE CURATOR, Botanic Station.
Antigua: THE AGRICULTURAL SUPERINTENDENT, St. John's.
St. Kitts: THE BIBLE AND BOOK SUPPLY AGENCY, Basseterre
Nevis: Mr. W. I. HOWELL, Experiment Station.
Bahamas: Mr. N. D. SANDS, Board of Agriculture, Nassau.

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*This publication ceased on 18th March, 1922. It has since been replaced by "Tropical Agriculture" the official organ of the Imperial College of Tropical Agriculture, Trinidad.

Advocate Co., Ltd.—Printers.